

We Claim:

- 1) A process for delivering a polynucleotide complexed with a compound into an extravascular muscle cell of a mammal, comprising:
 - a) mixing the polynucleotide and a polymer to form a complex wherein the zeta potential of the complex is not positive;
 - b) inserting the polynucleotide into a mammalian blood vessel, *in vivo*;
 - c) increasing the permeability of the blood vessel;
 - d) passing the complex through the blood vessel;
 - e) delivering the complex into the mammalian muscle cell; and,
 - f) expressing the polynucleotide.
- 2) The complex of claim 1 wherein the complex is delivered to the cell by inserting the polynucleotide into a mammalian vessel;
- 3) The complex of claim 4 wherein the complex is delivered to the cell by increasing the permeability of the vessel;
- 4) The process of claim 1 wherein increasing the permeability of the vessel consists of increasing pressure against vessel walls.
- 5) The process of claim 4 wherein increasing the pressure consists of increasing a volume of fluid within the vessel.
- 6) The process of claim 5 wherein increasing the volume consists of inserting the polynucleotide in a solution into the vessel.
- 7) The process of claim 1 wherein the muscle cell is a skeletal muscle cell.

8) The process of claim 1 wherein the compound is a lipid or a lipid derivative.

9) The process of claim 1 wherein the compound is a polymer consisting of histone, PFI, cationic lipid, poly-L-lysine, histone-lipid, histone-lipid-poly-L-lysine, or a derivative thereof.

- 10) The process of claim 1 wherein the zeta potential of the complex is negative.
- 11) A complex for *in vivo* polynucleotide expression, comprising: a combination of at least two compounds characterized by the complex zeta potential which is not positive and ability to facilitate delivery of a polynucleotide to a cell where it is expressed.
- 12) The complex of claim 11 wherein the cell is selected from the group consisting of liver cells, heart cells, and muscle cells.
- 13) The complex of claim 12 wherein the muscle cell consists of a skeletal muscle cell.
- 14) A process for delivering a polynucleotide complexed with a compound into an extravascular liver cell of a mammal, comprising:
- a) mixing the polynucleotide and a polymer to form a complex wherein the zeta potential of the complex is not positive;
 - b) inserting the polynucleotide into a mammalian blood vessel, *in vivo*;
 - c) increasing the permeability of the blood vessel;
 - d) passing the complex through the blood vessel;
 - e) delivering the complex into the mammalian muscle cell; and,
 - f) expressing the polynucleotide.
- 15) The process of claim 14 wherein the liver cell consists of an hepatocyte.
- 16) The complex of claim 15 wherein the complex is delivered to the cell by inserting the polynucleotide into a mammalian vessel;
- 17) The complex of claim 16 wherein the compound is selected from the group consisting of:
- a) polyethylene glycol;
 - b) polyvinylpyrrolidone;
 - c) polyvinylalcohol;
 - d) polyvinylamine;
 - e) polyvinylcarbazole;
 - f) polyvinylpyridine;
 - g) polyvinylbenzothiazole;
 - h) polyvinylbenzoxazole;
 - i) polyvinylbenzimidazole;
 - j) polyvinylbenzofuran;
 - k) polyvinylbenzofuran;
 - l) polyvinylbenzoxazine;
 - m) polyvinylbenzoxazoline;
 - n) polyvinylbenzoxazolinone;
 - o) polyvinylbenzoxazinone;
 - p) polyvinylbenzoxazinone;
 - q) polyvinylbenzoxazinone;
 - r) polyvinylbenzoxazinone;
 - s) polyvinylbenzoxazinone;
 - t) polyvinylbenzoxazinone;
 - u) polyvinylbenzoxazinone;
 - v) polyvinylbenzoxazinone;
 - w) polyvinylbenzoxazinone;
 - x) polyvinylbenzoxazinone;
 - y) polyvinylbenzoxazinone;
 - z) polyvinylbenzoxazinone;
- 18) The process of claim 17 wherein increasing the permeability of the vessel consists of:
- a) increasing the permeability of the vessel;
 - b) increasing the permeability of the vessel;
 - c) increasing the permeability of the vessel;
 - d) increasing the permeability of the vessel;
 - e) increasing the permeability of the vessel;
 - f) increasing the permeability of the vessel;
 - g) increasing the permeability of the vessel;
 - h) increasing the permeability of the vessel;
 - i) increasing the permeability of the vessel;
 - j) increasing the permeability of the vessel;
 - k) increasing the permeability of the vessel;
 - l) increasing the permeability of the vessel;
 - m) increasing the permeability of the vessel;
 - n) increasing the permeability of the vessel;
 - o) increasing the permeability of the vessel;
 - p) increasing the permeability of the vessel;
 - q) increasing the permeability of the vessel;
 - r) increasing the permeability of the vessel;
 - s) increasing the permeability of the vessel;
 - t) increasing the permeability of the vessel;
 - u) increasing the permeability of the vessel;
 - v) increasing the permeability of the vessel;
 - w) increasing the permeability of the vessel;
 - x) increasing the permeability of the vessel;
 - y) increasing the permeability of the vessel;
 - z) increasing the permeability of the vessel;

- 19) The process of claim 18 wherein increasing the pressure consists of increasing a volume of fluid within the vessel.
- 20) The process of claim 19 wherein increasing the volume consists of inserting the polynucleotide in a solution into the vessel.
- 21) The process of claim 14 wherein the compound is selected from the group consisting of histone, PEI, cationic lipid, poly-L-lysine, histone-lipid, histone-polyamine, and protamine.
- 22) The process of claim 14 wherein the zeta potential of the complex is negative.